

REMARKS

The Official Action dated October 6, 2010 has been carefully considered. Accordingly, the present response is believed sufficient to place this application in condition for allowance. Reconsideration is respectfully requested.

By the present amendment, all of the claims have been amended for purposes of clarity. No new matter has been introduced. For example, "light generating means" has been replaced by "light source." Support for this change can be found, for example, in Figure 11 of the original application. In addition, new claims 36-42 are all in dependent form and do not introduce new matter. For example, new claims 36-39 merely specify wavelength parameters similar to those provided in claims 14 and 16. New claim 40 merely specifies that the light directed to the surface of the cartilage is white light, as disclosed for example, in paragraph [0047] of the original application. And new claims 41 and 42 specify that the two-dimensional intensity detector is a CCD camera, as disclosed, for example, in paragraph [0045] of the original application.

Claims 1, 4-6, 8-11, 13-16 and 31-35 were rejected under 35 U.S.C. 103(a) as being obvious over Cane et al. (U.S. 2001/0056237) in view of the Pastoureau et al. article. Applicant respectfully disagrees, as the Examiner has failed to establish a *prima facie* case of obviousness.

Cane et al. is directed to apparatus and methods for monitoring the presence of one or more chromophores (such as melanin) in skin. As part of the process of determining, for example, the amount of melanin in skin, Cane describes a method for estimating skin thickness based on the remittance of light at one or more wavelengths. However, unlike applicant's claimed invention, the skin thickness measurement technique of Cane simply looks at remitted light from a layer of skin without taking into account back-scattered light from a second tissue layer underlying the targeted tissue layer.

Applicant's claimed invention measures the thickness a layer of tissue (namely, cartilage) located over a second layer of tissue (subchondral bone). The thickness of the cartilage layer is measured based on the intensities of light back-scattered from both the cartilage and the bone layers for at least two different wavelengths of light, in conjunction with predetermined optical properties of cartilage and subchondral bone. In contrast, Cane et al. estimates skin thickness using only remitted light from the skin layer. The skin thickness analysis in Cane does not in any way utilize remitted light from a second underlying tissue layer, let alone predetermined optical properties from a second underlying tissue layer. In fact, Cane states that at certain wavelengths ("far into the infrared, say at 100nm") it is possible to determine skin thickness "using a single wavelength measurement." Cane at paragraph [0141]. And while papillary dermis and cartilage both comprise collagen fibers, the similarities end there. For example, while the papillary dermis includes additional components such as blood and melanin which absorb light (see paragraph [0141] of Cane), cartilage lacks a blood supply (see paragraph [0007] of present application). As noted in Cane, the spectral characteristics of light remitted by the skin are "altered by the effects of melanin, blood and other chromophores in the skin." Cane at paragraph [009]. In addition, Cane also states that light penetrating through the skin to the reticular dermis is not back-scattered by this underlying layer (see paragraph [0008])—further demonstrating that the thickness estimation taught by Cane does not in any way take into account light back-scattered from an underlying layer nor any predetermined optical property of an underlying layer. Thus, the apparatus and methods taught by Cane et al. operate in a fundamentally different way to estimate skin thickness—namely, only using light back-scattered from the layer being measured, and without using a predetermined optical property of an underlying layer.

In addition to methods of Cane et al. operating in a fundamentally different way, the Examiner correctly states that "Cane et al don't teach measuring cartilage thickness based on optical properties of subchondral bone and cartilage." Official Action, at page 3. The Examiner, however, has taken the position that the Pastoureau reference discloses "measuring cartilage thickness based on optical properties of subchondral bone an cartilage." Id. at page 4, and

therefore applicant's claimed invention is obvious in view of Cane and Pastoreau. Applicant respectfully asserts that the Examiner has misconstrued the teachings of Pastoreau et al.

Pastoreau does disclose a method of measuring the thickness of a cartilage layer overlying subchondral bone. However, it does so in a manner so distinct from the skin thickness measurement technique taught by Cane, that it would be impossible to combine the teachings of these two references—let alone do so in a way which results in an apparatus or method meeting all of the limitations of applicant's claimed invention. In Pastoreau, in order to measure cartilage thickness, tibias are surgically removed and then stripped of tendons and muscles. Pastoreau at page 413. A microtome (a "Polycut E") is then used to cut a slice of cartilage and bone from the middle of the tibial joint, and the slice is then stained with safranin O or Goldner trichrome. Id. at pages 412 and 413. Thereafter, a microscope is used to visually observe the stained, cross-sectional slice of cartilage and bone. The user manually defines the extent of cartilage in the cross-section view (i.e., the area between reference marks 1 and 2 in Fig. 2(A) of Pastoreau). Finally, an image analysis system calculates the cartilage thickness "as the mean length of all the segments generated from each pixel situated on the border of the corresponding area of the cartilage," using a picture of the cross-sectional slice taken through a microscope. Id. at page 414. In other words, the thickness determination in Pastoreau is based on the simple fact that if one looks at a slice of cartilage/bone under a microscope, the layers of cartilage and bone can be easily identified (and even measured). Of course this simple measurement techniques has nothing to do with using predetermined optical properties of cartilage and bone, as the Examiner has suggested.

In order to find an invention obvious to one of ordinary skill in the art under 35 U.S.C. §103(a), there must have been an apparent reason to combine known elements in the fashion of the claim at issue, *KSR International Company v. Teleflex, Inc.*, 550 US 398 (2007). Neither Cane et al. nor Pastoreau provide any apparent reason for one of ordinary skill in the art to even attempt to combine their respective teachings. Not only is such a combination impossible, the invasive teachings of Pastoreau are directly contrary to the stated purpose of Cane et al. Cane is specifically directed to the "in vivo observation of a subject without the need for any surgical

intervention." Cane at paragraph [0001]. Cane also states that the invention described therein is specifically designed for the investigation of epithelial tissue "without removing the tissue being investigated from the body of the subject." Id. In contrast, the imaging technique of Pastoureau requires not only the surgical removal of the subject's tibia and overlying cartilage, but also cutting a slice of cartilage and bone from the middle of the tibia joint. There clearly would be no logical reason or motivation for one skilled in the art to try to combine the teachings of Pastoureau with Cane et al.

Accordingly, the apparatus and methods defined by the present claims are nonobvious over and patentably distinguishable from the combination of Cane et al. and Pastoureau, whereby the rejection under 35 U.S.C. §103 has been overcome. Reconsideration is respectfully requested.

It is believed that the above represents a complete response to the Official Action and places the present application in condition for allowance. Reconsideration and an early allowance are requested.

Please charge any fees required in connection with the present communication, or credit any overpayment, to Deposit Account No. 503915.

Respectfully submitted,

/Martin J. Miller/

Martin J. Miller
Reg. No. 35,953
Porter, Wright, Morris & Arthur LLP
250 East Fifth Street, Suite 2200
Cincinnati, Ohio 45202
(513) 369-4250